

Hawaii State Report - 2014

Annual W6 State Technical Advisory Summary

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In 2014, germplasm of various plant species from the National Plant Germplasm System (NPGS) was requested and used by various Hawaii State agencies, farmers, nurseries, hobbyists and researchers in disciplines such as genetics, horticulture, botany, plant pathology and agronomy. The following is a summary of information regarding the performance of the germplasm material Hawaii State groups have requested from the NPGS.

Summary

An email was sent out on May 25, 2015 to the 24 groups in Nevada State that requested germplasm from the NPGS in 2014. The request asked for information regarding the performance of the 103 different accessions received, i.e. germination success or percent germinated, grafting success, propagation success, publications etc. We received 10 responses to our request. Among the responses, a total of 24 different taxa were requested; *Amaranthus retroflexus*, *Ananas comosus* var. *comosus*, *Artocarpus altilis*, *Artocarpus odoratissimus*, *Atriplex hymenelytra*, *Atriplex polycarpa*, *Averrhoa carambola*, *Bactris gasipaes* var. *gasipaes*, *Carica papaya*, *Dactyloctenium aegyptium*, *Eleusine indica*, *Glycine max*, *Gomphrena globosa*, *Gynandropsis gynandra*, *Malpighia glabra*, *Setaria italica* subsp. *italica*, *Theobroma cacao*, *Triticum aestivum* subsp. *aestivum*, *Triticum turgidum* subsp. *durum*, *Vaccinium reticulatum*, , *Vasconcellea parviflora*, *Vasconcellea quercifolia*. Utilization of samples included research of fractionation patterns of stable carbon isotopes in C4 plant biomass grown under elevated CO2 conditions, using the germplasm as a fill/border seed in trials and increases, back-up for Miami germplasm selection, propagation, breeding and test marketing of fruit production, set-up of a Cacao family farm. The requestors received their material in good condition and most germinated well. There was a germination issue with *Vaccinium reticulatum*. The requestor made three attempts to germinate the seed and was successful with about 15 seeds on the third attempt.

There was also an issue with *Theobroma cacao*. The requestor states that the material he received was not properly selected and that the Cacao scions he received had no buds initiated. Another requester gave specific details on germination rates for the lines requested: *Amaranthus retroflexus* - 88% (176/200 seeds); *Setaria italica* – 91% (182/200 seeds); *Eleusine indica* – 83.3% (125/150 seeds); *Dactyloctenium aegyptium* – 88.6% (133/150 seeds); *Gomphrena globosa* – 94% (141/150 seeds); *Atriplex polycarpa* – 54.7% (82/150 seeds)

There are no publications at this time for any of the germplasm requested.



Table 1. Summary of Responses

REQUESTOR/TAXON	RESPONSE
Josh Bostic University of Hawaii <i>(Amaranthus retroflexus,</i> <i>Setaria italica subsp. italica,</i> <i>Dactyloctenium aegyptium,</i> <i>Eleusine indica,</i> <i>Atriplex hymenelytra,</i> <i>Atriplex polycarpa,</i> <i>Gomphrena globosa,</i> <i>Gynandropsis gynandra,</i>	<i>Amaranthus retroflexus</i> <i>Setaria italica subsp. italica</i> #1 What was it Used for: Pilot Experiment: 7 samples of each species were grown within indoor growth chambers at ambient CO ₂ concentrations to determine whether species could be efficiently growth under the conditions needed

Enneapogon desvauxii,
Eragrostis cilianensis,
Eragrostis cylindriflora
Eragrostis gangetica ,
Chloris virgata ,
Melinis repens,
Urochloa deflexa
Urochloa xantholeuca
)

for our experiment.

Elevated CO₂ Experiment

100 samples of each species were grown at 5 levels of pCO₂: 400ppm, 550ppm, 750ppm, 100ppm, and 1400ppm (20 samples per pCO₂ level), within indoor growth chambers to determine the effect of CO₂ concentration on the stable carbon isotope composition of above ground biomass and growth rates of C4 plants. Light intensity, soil moisture, and humidity were held constant for all samples.

#2 Was it a success: Yes, we grew these species for 3 weeks and conducted stable isotope analysis on the resulting plant tissues. Above ground biomass data was also collected to determine whether pCO₂ affected growth rate and yield.

#3 Publications: Results from these experiments have not yet been published, but we expect a publication by the end of 2015 once growth experiments are completed.

#4 General Info:

Amaranthus retroflexus germination efficiency: 88% (176 out of 200 seeds)

Setaria italica germination efficiency: 91% (182 out of 200 seeds)

Dactyloctenium aegyptium

Eleusine indica

#1 What was it Used for: 50 samples of each species were grown at 5 levels of pCO₂, 400ppm, 550ppm, 750ppm, 100ppm, and 1400ppm (10 samples per pCO₂ level), within indoor growth chambers to determine the effect of CO₂ concentration on the stable carbon isotope composition of above ground biomass and growth rates of C4 plants. Light intensity, soil moisture, and humidity were held constant for all samples.

#2 Was it a success: Yes, we were able to grow both species for 3 weeks and conducted stable isotope analysis on the resulting plant tissues. Above ground biomass data was also collected to determine whether pCO₂ affected growth rate and yield.

#3 Publications: Results from these experiments have not yet been published, but we expect a publication by the end of 2015 once growth experiments are completed.

#4 General Info:

Eleusine indica germination efficiency: 83.3% (125 out of 150 seeds)

Dactyloctenium aegyptium germination efficiency: 88.6% (133 out of 150 seeds)

Atriplex hymenelytra

Atriplex polycarpa

#1 What was it Used for: 4 samples of each species were grown within indoor growth chambers at ambient CO₂ concentrations to determine whether species could be efficiently grown under the conditions needed for our experiment. Growth rates and yields of multiple species were compared in this pilot experiment to select 2 species to be grown at elevated CO₂ concentrations.

#2 Was it a success: Both species were grown for 3 weeks and harvested. *Atriplex polycarpa* was selected to be grown at elevated CO₂ concentrations in the actual experiment (see order 263661 below).

#3 Publications: Results from this pilot experiment will not be published.

#4 General Info:

Gomphrena globosa

#1 What was it Used for:

Pilot Experiment:

4 samples of each species were grown within indoor growth chambers at ambient CO₂ concentrations to determine whether species could be efficiently grown under the conditions needed for our experiment.

Elevated CO₂ Experiment

50 samples were grown at 5 levels of pCO₂: 400ppm, 550ppm, 750ppm, 100ppm, and 1400ppm (10 samples per pCO₂ level), within indoor growth chambers to determine the effect of CO₂ concentration on the stable carbon isotope composition of above ground biomass and growth rates of C4 plants. Light intensity, soil moisture, and humidity were held constant for all samples.

#2 Was it a success: Yes, we grew this species for 3 weeks and conducted stable isotope analysis on the resulting plant tissues. Above ground biomass data was also collected to determine whether pCO₂ affected growth rate and yield.

#3 Publications: Results from these experiments have not yet been published, but we expect a publication by the end of 2015 once growth experiments are completed.

#4 General Info:

Gomphrena globosa germination efficiency: 94% (141 out of 150 seeds)

Gynandropsis gynandra

#1 What was it Used for: 4 samples were grown within indoor growth chambers at ambient CO₂ concentrations to determine whether species could be efficiently grown under the conditions needed

for our experiment. Growth rates and yields of multiple species were compared in this pilot experiment to select 2 species to be grown at elevated CO₂ concentrations.

#2 Was it a success: This species was grown for 3 weeks and harvested. Species was not selected for further experimental testing at elevated CO₂ concentrations.

#3 Publications: Results from this pilot experiment will not be published.

#4 General Info:

Atriplex polycarpa

#1 What was it Used for: 50 samples were grown at 5 levels of pCO₂: 400ppm, 550ppm, 750ppm, 100ppm, and 1400ppm (10 samples per pCO₂ level), within indoor growth chambers to determine the effect of CO₂ concentration on the stable carbon isotope composition of above ground biomass and growth rates of C4 plants. Light intensity, soil moisture, and humidity were held constant for all samples.

#2 Was it a success: Yes, we grew this species for 3 weeks and conducted stable isotope analysis on the resulting plant tissues. Above ground biomass data was also collected to determine whether pCO₂ affected growth rate and yield.

#3 Publications: Results from these experiments have not yet been published, but we expect a publication by the end of 2015 once growth experiments are completed.

#4 General Info:

Atriplex polycarpa germination efficiency: 54.7% (82 out of 150 seeds)

Enneapogon desvauxii

Eragrostis cilianensis

Eragrostis cylindriflora

Eragrostis gangetica

#1 What was it Used for: 4 samples of each species were grown within indoor growth chambers at ambient CO₂ concentrations to determine whether species could be efficiently grown under the conditions needed for our experiment. Growth rates and yields of multiple species were compared in this pilot experiment to select 2 species to be grown at elevated CO₂ concentrations.

#2 Was it a success: None of these samples sprouted within the 3 week allotted timeframe of the pilot experiment, likely due to the perennial lifecycle of these particular species. Therefore, these species were not selected for the actual experiment.

#3 Publications: Results from this pilot experiment will not be published.

#4 General Info:

Chloris virgata

Dactyloctenium aegyptium

Eleusine coracana subsp. africana

Enneapogon cenchroides

Melinis repens

Urochloa deflexa

Urochloa xantholeuca

#1 What was it Used for: 4 samples of each species were grown within indoor growth chambers at ambient CO₂ concentrations to determine whether species could be efficiently grown under the conditions needed for our experiment. Growth rates and yields of multiple species were compared in this pilot experiment to select 2 species to be grown at elevated CO₂ concentrations.

#2 Was it a success: None of the *Enneapogon cenchroides* samples sprouted within the 3 week allotted timeframe of the pilot experiment, likely due to the perennial lifecycle of this species.

All of the other species sprouted within 3 days and were grown for the full 3 week timeframe. Above ground biomass data was also collected to determine whether pCO₂ affected growth rate and yield.

Dactyloctenium aegyptium was selected to be grown in the elevated

	<p>CO₂ experiment (see write-up of order number 259914 above for results of elevated CO₂ experiment).</p> <p>#3 Publications: Results from this pilot experiment will not be published.</p> <p>#4 General Info: Only annual species germinated within the three week timeframe of our experiment under the conditions present within our indoor growth chambers.</p>
<p>Tracie Matsumoto USDA, ARS, PBARC <i>(Theobroma cacao)</i></p>	<p>What was the germplasm used for? Back-up for the Miami germplasm selection.</p> <p>Did you have success? Yes.</p> <p>Will there be any publications? Maybe, after plants are established and evaluation is complete.</p> <p>General comments. Thank you for your time in collecting this information.</p>
<p>Gabriel Sachter-Smith University of Hawaii <i>(Triticum aestivum)</i></p>	<p>Gabriel, Please see David Stout's email.</p>
<p>Justin Robinson Syngenta <i>(Glycine max)</i></p>	<p>We are using this germplasm as fill/border seed in our trials and increases. It is not being used as breeding material. The germination was good.</p>

<p>Dusty Thomas Captain Cook, Hawaii (<i>Ananas comosus var. comosus</i>, <i>Bactris gasipaes var. gasipaes</i>)</p>	<p>What was the germplasm used for? The material was acquired for breeding and test marketing of fruit production.</p> <p>Did you have success? The plant and seeds survived. Considering it takes a very long time for the planting material to mature, I am able to determine the results of the material at this time.</p> <p>Will there be any publications? I am working with HTFG in this area to identify and support marketable materials not currently in wide scale use, to further options to the public for widening available options to the local economy. Ken Love routinely publishes material from the trials. But nothing is yet planned for these accessions because of lack of results.</p> <p>General comments. The plants seem to be doing well and I have good hope for success in getting these plants to maturity. Keeping in mind, one pineapple culture is a very small sampling.</p>
<p>Rich Cosgrove Hana, Hawaii (<i>Theobroma cacao</i>)</p>	<p>My purpose is to set-up a cacao family farm. Thus no scientific publications are expected to be made.</p> <p>In the past, I had very good response from the USDA germplasm folks in Hilo, but since Dr. Zee has left, I do not even get e response to my emails.</p>

	<p>I am a very small grower on Maui and feel it important to follow the local procedures in obtaining plant material that is known to be “clean.” This has become difficult since Dr. Zee retired.</p> <p>The material that I had received has been successfully used but not as efficiently as it could have been due to some misinformation as to the best procedures for growing in Hawaii. Thus I have requested additional material and have not received any response.</p> <p>The last material that I received was not properly selected. It is a waste of everyone’s time and expense to send cacao scions that have no buds initiated. I did the best I could under the circumstances and I’m still trying to establish a family cacao farm that has the best clones available and have avoided importing material from outside sources.</p> <p>Please understand that I am most grateful for the wonderful support that I have received in years past.</p>
<p>Dwight Sato Hilo, Hawaii <i>(Vaccinium reticulatum)</i></p>	<p>I’ve been having germination problems since I received the seeds. Only about three months ago, after my third attempt with a small batch (about 15 seedlings) was I successful in germinating them. I’ve been giving the young seedlings a light application of liquid fertilizer and they seem to be responding but growth is slow. I would</p>

	<p>like to try again with a more recent batch. No publication is being planned. I appreciate your program which offers germplasm seeds and I enjoy the challenge to try what ARS has been researching.</p>
<p>Christopher Carter Laupahoehoe, Hawaii (<i>Ananas comosus var. comosus</i>, <i>Carica papaya</i>, <i>Vasconcellea parviflora</i>, <i>Vasconcellea quercifolia</i>)</p>	<p>Yes, the two pineapples (White Jade and Dry Sweet) are in the ground about 18' in diameter and the papaya species are now fruiting. All seeds are growing at my place and a few friends' yards. In Waipio Valley area (Big Island). I will upload recent photos to show you soon. Mahalo!</p>
<p>John Juszczak Hilo, Hawaii (<i>Ananas comosus var. comosus</i>, <i>Artocarpus altilis</i>, <i>Artocarpus odoratissimus</i>, <i>Averrhoa carambola</i>, <i>Malpighia glabra</i>)</p>	<p>The germplasm was for propagation. As for the results for each:</p> <ul style="list-style-type: none"> - pineapple (<i>Ananas</i>) - they are doing well. I think I lost one in the transition to harden off coming out of flask - breadfruit (<i>A. altilis</i>) - complete loss. I had requested scions for grafting, all the scion material was too large a diameter to be easily used for grafting. I tried to graft a couple but because of the size, could not make a decent graft, grafts failed. I tried to root the remainders. A couple looked like they might be succeeding but I had to travel and I think they went a little too long without being watered. - marang (<i>A. odor.</i>) - good germination, growing well. - starfruit (<i>Averrhoa</i>) - a couple of grafts

succeeded

- *Malpighia* - initially looked like cuttings were rooting but (as with breadfruit), went a little too long without water and lost all.

I am not growing these for research, per se. However, there could be a publication or presentation at some point when fruit production begins, if results might be of interest to local fruit growers.